The Effect of Walking on Lower Body Disability among Older Blacks and Whites

ABSTRACT

Objectives. This study investigated the association between regular physical activity and risk of or increase in lower body disability in older, community-dwelling Blacks and Whites.

Methods. The present study used the 1984 to 1990 Longitudinal Study on Aging, which included 413 Black and 3428 White self-respondents 70 years of age or older. Discrete-time hazard models provided estimates of the effects of self-reported walking frequency and regular exercise on lower body disability among Black and White self-respondents.

Results. Whites who reported walking 4 to 7 days per week at baseline vs those who reported never walking 1 mile (1.6 km) or more experienced a one-third lower risk of increased disability. Blacks who reported walking 4 to 7 days per week experienced a two-thirds lower risk. Walking 4 to 7 days per week reduced the risk of disability onset by 50% to 80% on all five disability items within the Black sample and by 50% on two items within the White sample.

Conclusions. Among older Blacks, walking 4 to 7 days per week had a greater protective effect against lower body decline than any of the other factors, including age and chronic conditions. (*Am J Public Health.* 1996;86:57–61)

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Introduction

Although there is a fair amount of literature on health and its predictors in late life, there is considerably less information on the health behaviors of older adults. Even less information is available on the health behaviors of low-income and minority older adults. This remains the case despite the declaration that "the public health field is committed to decreasing social disparities in health"[1(p892)] and the fact that socioeconomic variability in mortality, health, and functioning is in large part an outcome of life-style and behaviors over the life course.[1–5]

Recently, a number of authors have shown that physical activity (both self-reported[6–9] and monitored[10,11]) is particularly important for the maintenance of physical function among elderly people. None of these studies, however, have examined activity levels or the effects of activity among older Blacks. Literature on the association among age, race, and functional status has demonstrated unique effects of age on functional status and functional status decline across Black and White subsamples.[12,13] Lifelong disadvantages in the social and physical milieus of Blacks have been postulated to select out the least robust members of the Black population and leave a physiologically hardy oldest-old Black population.[14] Such processes suggest that factors affecting the health and functional status of Blacks and Whites may differ. Investigation of these factors across race subgroups at all stages of the life course will be necessary if the unique forces that bring about racial differences in health status are to be understood.

In this paper, the association between activity (i.e., self-reports of walking and regular exercise) and risk of an onset and increase in lower body disability over a 6-year period is investigated separately for older Blacks and Whites. Both clinical[11] and observational[15] research on functional status decline has shown that lower forms of functioning (e.g., activities of daily living) are affected, in large part, through changes in higher forms of functioning (e.g., lower body functioning). It has also been shown that "each lower-body disability item is measured with the same validity across race and gender groups."[16(p30)] This has not been shown to be the case for other measures of physical function.[16] Limitations in other types of physical function (e.g., activities of daily living) are also less common than lower body disability, and capturing even a moderate number of cases involving a limitation requires a considerable sample size. Thus, for practical, theoretical, and empirical reasons, this study focused on the effect of activity on lower body disabilities among older Blacks and Whites.

Methods

Data

The data used in this study were taken from the Longitudinal Study on Aging.[17] These data were collected by the National Center for Health Statistics in conjunction with the National Institute on Aging and were intended to capture the experiences of older adults as they move through various levels of health and disability to institutionalization and

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TABLE 1—Racial Differences in Sociodemographic, Health, and Activity Measures among Subjects from the Longitudinal Study on Aging, 1984

	Blacks (n = 423)	Whites (n = 3254)
Age, y, %		
70–74	50.8	35.6***
75–79	29.1	27.3
80–84	14.9	24.2***
85–99	5.2	12.8***
Male, %	37.8	37.6
Married, %	41.9	48.0*
Income,[a] %		
Under $5000	32.9	11.3***
$5000–$6999	20.1	12.7***
$7000–$9999	20.6	20.6
$10 000–$14 999	15.0	22.5**
$15 000–$19 999	4.8	13.3**
$20 000 or more	6.5	19.6***
8 years of education or less, %	61.2	36.5***
Perceived health, %		
Excellent–very good	31.9	41.5***
Good	28.6	33.7*
Fair–poor	39.5	24.9***
Low perceived health control, %	18.0	15.3
Mean body mass index (SD)	25.9 (0.23)	24.3 (0.07)***
Mean no. of lower body disabilities (SD) (range = 0–5)	1.61 (0.09)	1.31 (0.03)***
Mean no. of chronic conditions (SD) (range = 0–5)	0.34 (0.03)	0.68 (0.02)*
Ever had hypertension, %	53.7	43.1***
Had diabetes over previous 12 months, %	15.6	7.4***
Had rheumatism/arthritis over previous 12 months, %	59.6	49.2***
Regular exercise, %	26.5	30.0*
Walk 1 mile		
Never	62.3	58.0**
1 or fewer days per week	15.3	15.2*
2–3 days per week	7.5	9.3*
4–7 days per week	14.8	17.5

Note. Asterisks indicate statistical significance of Black/White differences.
[a]Sixteen percent of the sample did not report income.
*$P < .05$; **$P < .01$; ***$P < .001$.

death.[18] Briefly, the sample was obtained from the 1984 National Health Interview Survey (NHIS) of persons 55 years of age and older. All households in the 1984 NHIS with a resident 80 years of age or more were sampled, and all persons 80 years old or older and relatives 70 to 79 years old in these households were selected. An oversample of Blacks was obtained from the households by selecting all Black persons and their relatives 70 to 79 years of age. Of the remaining NHIS households containing non-Black persons 70 to 79 years old, one half were randomly chosen for inclusion. The respondents were reinterviewed by telephone, or information on date of death was collected, in 1986, 1988, and 1990. There were 4542 Longitudinal Study on Aging self-respondents eligible to be reinterviewed at all four waves. Although the data were obtained through a stratified multistage cluster sample, previous analyses have indicated that using weighted data has little effect on variance estimation, particularly with age and race incorporated into analyses as covariates.[18] Therefore, the unweighted data were used in this study.

Persons who, at baseline, reported that they were unable to walk one-quarter mile (0.4 km) (n = 701) were excluded from the analyses of this study. Although other studies have generally excluded older adults with limitations at baseline,[7,8,10] ability to walk was the only restriction criterion used for this investigation because the objective was to examine a sample of older adults reflecting as closely as possible the characteristics of older Blacks and Whites living in the community. Use of a sample that reflects diversity in the community is important when the interest is in the potential impact of such risk factors on community health.[19]

Measures

The Longitudinal Study on Aging contains reasonably standard measures of self-care capacity and physical functioning. Lower body disabilities are represented through five items that measure whether or not people have difficulty (1) walking one-quarter mile (a separate question asking whether respondents were unable to walk one-quarter mile was used for the restriction criteria noted above); (2) walking up 10 steps without rest; (3) standing or being on their feet for 2 hours; (4) stooping, crouching, or kneeling; and (5) lifting or carrying 25 lbs (11.25 kg). Cronbach's alpha for this scale has been reported to be .86.[20] Other authors have estimated the effect of physical activity on difficulty walking; as a means of further ensuring confidence in the results of the present study, however, difficulty walking one-quarter mile was dropped from the lower body scale. Thus, the range for the scale was 0 to 4, with 4 representing maximal disability. The alpha for the lower body scale with walking excluded was .82 in the sample used here. In analyses of the effect of activity on each of the lower body items individually, difficulty walking one-quarter mile was examined as an outcome variable.

An increase in lower body disability was defined as an increase over baseline at any of the three follow-ups in the number of lower body items the respondent reported difficulty performing. Those who reported no change or who improved were coded as having no functional decline. Although placing those who maintain and those who see improvement into the same category is not ideal, maintenance or improvement of function is considered a positive nonevent. Because this study did not focus solely on functionally intact elderly people, some individuals were left censored (i.e., had the maximum number of disabilities at

baseline; 46 [11%] Blacks and 37 [8%] Whites). Nearly 20% of those left censored reported regular exercise, and 12% reported walking 1 mile once a week or more. These persons were included in the descriptive analyses but excluded from the assessments of risk factors for disability.

Perceived health, perceived health control, body mass index, and type and number of chronic conditions were incorporated into the analyses as control variables, along with number of lower body disabilities at baseline. There was the potential for each type of chronic condition to have a different effect on the risk of increased disability,[21] so common conditions likely to affect both activity and functioning through medications, doctors' orders, pain, and/or discomfort were singled out. Separate indicators of the existence of arthritis or rheumatism and diabetes over the 12 months prior to the interview and an indicator of ever having had hypertension were created. The remaining conditions were incorporated into a single measure of number of conditions and included osteoporosis, broken hip, arteriosclerosis, rheumatic fever or heart disease, coronary heart disease, angina, myocardial infarction, other heart attack, stroke, Alzheimer's disease, cancer, aneurysm, blood clot, and varicose veins. Number of conditions formed a skewed distribution and was truncated at three. This produced a less skewed distribution, with no more than 3% of the scores being recoded. (In analyses not shown, each individual disease was incorporated into the models. These additional disease variables were not significant and did not change the estimates for the other predictor variables.)

Age, income, educational attainment, gender, and marital status have all been identified as important covariates of race in studies of racial differences in health and were used in this study. Because the effects of age were not expected to be linear among Blacks, age was recoded and the effect of each of four age groups estimated. An issue of further consideration regarding the sociodemographic measures was that 16% of the sample did not report income. As has been done in other studies based on Longitudinal Study on Aging data,[12] values for income were imputed with predicted values obtained by regressing income on available covariates (R^2 = .27). However, separate models for Blacks and Whites indicated that income had no effect on the risk of disability (data not shown), and income was excluded from the analyses reported here.

TABLE 2—Odds Ratios for Predictors of Increased Lower Body Disability, 1984 through 1990

	Odds Ratio (95% Confidence Interval)	
	Blacks (n = 342)	Whites (n = 2812)
Age, y		
70–74	1.00 ...	1.00 ...
75–79	1.99 (1.26, 3.1)	1.19 (1.04, 1.35)
80–84	1.04 (0.59, 1.82)	1.77 (1.52, 2.07)
85+	1.31 (0.56, 3.07)	2.75 (2.18, 3.47)
Male	0.64 (0.42, 0.98)	0.74 (0.65, 0.84)
Married	0.79 (0.52, 1.20)	0.99 (0.87, 1.12)
8 years of education or less	1.06 (0.73, 1.54)	0.90 (0.79, 1.02)
Perceived health		
Excellent–very good	1.00 ...	1.00 ...
Good	1.04 (0.66, 1.62)	1.32 (1.16, 1.49)
Fair–poor	1.34 (0.85, 2.11)	1.71 (1.44, 2.02)
Low perceived health	1.24 (0.69, 2.22)	0.95 (0.79, 1.14)
Body mass index	1.02 (0.98, 1.06)	1.00 (0.99, 1.02)
No. of baseline lower body disabilities		
0	1.00 ...	1.00 ...
1	1.39 (0.88, 2.19)	1.16 (1.00, 1.34)
2	0.79 (0.44, 1.39)	1.16 (0.97, 1.38)
3	2.14 (1.07, 4.29)	0.67 (0.54, 0.82)
No. baseline chronic conditions		
0	1.00 ...	1.00 ...
1	1.14 (0.72, 1.81)	1.16 (1.02, 1.32)
2	1.02 (0.37, 2.85)	1.55 (1.24, 1.92)
3	0.63 (0.11, 3.63)	0.97 (0.72, 1.33)
Hypertension	0.74 (0.49, 1.12)	1.15 (1.03, 1.29)
Diabetes	0.92 (0.55, 1.57)	1.75 (1.34, 2.27)
Rheumatism/arthritis	1.71 (1.17, 2.50)	1.34 (1.20, 1.50)
Regular exercise	0.89 (0.59, 1.33)	1.00 (0.89, 1.14)
Walking frequency		
Never	1.00 ...	1.00 ...
1 or fewer days per week	0.91 (0.55, 1.49)	0.81 (0.69, 0.94)
2–3 days per week	0.82 (0.41, 1.67)	0.79 (0.66, 0.95)
4–7 days per week	0.37 (0.22, 0.64)	0.66 (0.56, 0.77)

The measures of physical activity were all self-reported and have been detailed in other studies.[7] These questions were asked only in the 1984 Longitudinal Study on Aging. Because previous studies have noted the importance of regular activity and authors have noted the need for quantifiable measures of activity,[8] this study focused on the effect of regular exercise and walking frequency. Yes and no responses were given to the question "Do you have a regular exercise routine?" Respondents were also asked to rate the frequency with which they walked 1 mile or more. Responses ranged from never to every day, with never being the mode. Frequency of walking was coded into four categories: never, less than 2 days per week, 2 to 3 days per week, and 4 to 7 days per week. Three days per week is the recommended minimum, and it would have been ideal to separate 2 days per week from 3; however, this is not possible in the Longitudinal Study on Aging.

Analyses

Discrete-time hazard models were estimated separately for Blacks and Whites. Sociodemographic characteristics, perceived health, perceived health control, body mass index, arthritis, diabetes, hypertension, number of other chronic conditions, and number of lower body disabilities at baseline were entered as controls in the models. The effect of activity (net of these controls) on the likelihood of increased lower body disability was estimated, followed by estimates of the effect of activity on the likelihood of

TABLE 3—Odds Ratios for Walking Frequency, by Type of Disability and Race: 1984 through 1990

	Walking Frequency, d/wk					
	Blacks			Whites		
	1 or Fewer	2–3	4–7	1 or Fewer	2–3	4–7
Stooping, crouching, or kneeling						
Disability onset, total no. (%)		254 (44)			2131 (42)	
Odds ratio (95% CI)	0.40 (0.21, 0.76)	0.76 (0.34, 1.7)	0.28 (0.14, 0.56)	0.93 (0.77, 1.11)	0.74 (0.59, 0.92)	0.74 (0.61, 0.89)
Standing for 2 hours						
Disability onset, total no. (%)		285 (52)			2298 (47)	
Odds ratio (95% CI)	0.61 (0.36, 1.03)	0.75 (0.35, 1.60)	0.25 (0.13, 0.47)	0.90 (0.76, 1.07)	0.86 (0.70, 1.05)	0.58 (0.48, 0.70)
Walking up 10 steps without rest						
Disability onset, total no. (%)		300 (33)			2694 (32)	
Odds ratio (95% CI)	0.29 (0.16, 0.52)	1.28 (0.60, 2.7)	0.54 (0.30, 0.97)	0.83 (0.68, 1.01)	0.85 (0.67, 1.07)	0.84 (0.69, 1.02)
Carrying 25 lbs						
Disability onset, total no. (%)		244 (53)			2162 (48)	
Odds ratio (95% CI)	1.1 (0.62, 1.97)	2.3 (1.03, 4.97)	0.52 (0.28, 0.97)	0.85 (0.71, 1.02)	0.79 (0.64, 0.99)	0.93 (0.77, 1.11)
Walking one-quarter mile						
Disability onset, total no. (%)		290 (41)			2556 (39)	
Odds ratio (95% CI)	0.31 (0.17, 0.58)	0.29 (0.12, 0.66)	0.17 (0.08, 0.34)	0.67 (0.56, 0.81)	0.52 (0.41, 0.65)	0.49 (0.40, 0.59)

Note. Never walking was the reference category. Covariates controlled included age, sex, marital status, education, perceived health, lower body disabilities, body mass index, rheumatism/arthritis, diabetes, hypertension, and number of other chronic conditions. Coding algorithms match those of Table 2. CI = confidence interval.

onset of disability for each of the five original lower body items separately, including difficulty walking one-quarter mile.

Results

Data on the variables used are presented in Table 1. Comparisons between the White and Black samples indicate considerable differences, as expected. A significantly lower percentage of Blacks than Whites reported a regular exercise routine, and fewer Blacks reported walking one mile or more.

Increased Lower Body Disability

Predictors of the risk of experiencing an increase in number of lower body disabilities are shown in Table 2. Although not shown, 53% of Whites and 56% of Blacks experienced increased disability in lower body items over the study period. Among those who experienced the event, the average increases in disabilities were 1.7 for Whites and 1.9 for Blacks.

The odds ratios for activity are shown through the measures of regular exercise and frequency of walking one mile or more. Each of the activity effects shown in Table 2 was in the expected direction, but only the effect of walking 4 to 7 days per week reached significance among Blacks. Each of the walking categories was significant among Whites. For Blacks, walking 4 to 7 days per week vs never walking reduced the risk of disability onset by two thirds. Walking 4 to 7 days per week reduced the risk by one third among Whites, and walking 3 or fewer days per week reduced the risk by one fifth. The effect of regular exercise was not significant for either race. Although not shown, separate models were estimated with either regular exercise or frequency of walking as predictors, but not both. The results of these analyses did not differ from the data shown in Table 2.

Onset of Specific Lower Body Disabilities

Because the analyses presented in Table 2 indicate that frequency of walking one mile, rather than reporting of a regular exercise routine, was the primary source of activity effects, the analyses shown in Table 3 concentrate on the effect of walking. The models that generated the estimates in Table 3 included all covariates of Table 2, including regular exercise. The estimates for the covariates do not vary appreciably from those reported in Table 2 and, in the interest of space, are not shown.

The sample sizes were smaller in the analyses of disability onset (Table 3), since persons had to be nondisabled at baseline on the particular lower body item to be included in the analyses. The Black samples ranged in size from 244 to 300. For each item, between 40% and 55% of the respondents not disabled at baseline experienced an onset of disability in that item over the 6-year study period (see Table 3).

For Blacks, the risk of onset in each lower body disability item was lower among those walking 4 to 7 days per week than among those who never walked. The relative odds of disability onset ranged from 0.17 to 0.54. In other words, those who reported never walking were roughly 1.9 to 5.9 times more likely to experience a disability onset than those who reported walking 4 to 7 days per week. With the exception of difficulty standing for 2

hours, the effects of walking 2 to 3 days or 1 or fewer days per week were generally not as substantial as the effect of walking 4 to 7 days per week.

Although the risk of disability onset in each item was affected by walking also among Whites, only standing for 2 hours and walking one-quarter mile were affected by walking 4 to 7 days per week. Those who walked 4 to 7 days per week were approximately one half as likely to experience difficulty standing for 2 hours or walking one-quarter mile as those who never walked. The risk of an onset of difficulty walking up 10 steps, carrying 25 lbs, or stooping was affected by walking 2 to 3 days per week and/or 1 or fewer days per week but not by walking 4 to 7 days per week.

Discussion

These data demonstrate the importance of physical activity for Blacks as well as Whites and raise questions about race differences in the meaning of activity and its impact on disability. Previous studies have concluded that measurement of lower body disability items does not differ for Blacks and Whites,[16] but no information on racial differences in self-reports of activity is available. Physical activity is less common among Blacks, which may reduce the pressure to be active or exercise. A lack of pressure may allow Blacks to report activity with greater accuracy than Whites, who feel more social pressure to report an active life-style. It is also possible that Whites are more likely to supplement walking with other types of activity or exercise, although reporting the existence of a regular exercise routine had no effect on risk of disability in these analyses. Finally, given the barriers that minority adults and adults of low socioeconomic status (SES) must overcome to be active,[22] Blacks who are walkers may be much more likely to be practicing additional health behaviors than Whites who are walkers. However, this latter explanation would be expected to be related to health control, which was statistically controlled in the models used in this study. Thus, a much broader scope of information on activity among Blacks and Whites will be needed to determine activity's relative impact.

A lack of studies investigating the importance of activity and the complete absence of interventions aimed at raising activity levels among low SES or Black older adults might be a public health concern. Whether one can simply transport what is learned in interventions with White older adults generally of middle SES to older adults of minority status and low SES is not certain. The greater frequency of functional problems,[3] lack of resources, more depressive symptoms,[23] lower perceived health, and lower levels of self-efficacy in exercise and other health behaviors[24] among socioeconomically disadvantaged elderly people are just a few of the factors that may alter the efficacy and strategy for exercise interventions within these populations. □

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